

Dynamics of Asymmetric Conflict

Pathways toward terrorism and genocide

ISSN: 1746-7586 (Print) 1746-7594 (Online) Journal homepage: <http://www.tandfonline.com/loi/rdac20>

Exploring the crime–terror nexus in the United States: a social network analysis of a Hezbollah network involved in trade diversion

Roberta Belli, Joshua D. Freilich, Steven M. Chermak & Katharine A. Boyd

To cite this article: Roberta Belli, Joshua D. Freilich, Steven M. Chermak & Katharine A. Boyd (2015) Exploring the crime#terror nexus in the United States: a social network analysis of a Hezbollah network involved in trade diversion, *Dynamics of Asymmetric Conflict*, 8:3, 263-281, DOI: [10.1080/17467586.2015.1104420](https://doi.org/10.1080/17467586.2015.1104420)

To link to this article: <http://dx.doi.org/10.1080/17467586.2015.1104420>



Published online: 30 Nov 2015.



Submit your article to this journal [↗](#)



Article views: 49



View related articles [↗](#)



View Crossmark data [↗](#)

Exploring the crime–terror nexus in the United States: a social network analysis of a Hezbollah network involved in trade diversion

Roberta Belli^a, Joshua D. Freilich^b, Steven M. Chermak^c and Katharine A. Boyd^d

^aUNDSS Somalia SIOC, Nairobi, Kenya; ^bDepartment of Criminal Justice, John Jay College, CUNY, New York, USA; ^cSchool of Criminal Justice, Michigan State University, East Lansing, MI, USA; ^dDepartment of Sociology, Philosophy, and Anthropology, University of Exeter, Exeter, UK

ABSTRACT

This exploratory study examines the nexus between crime and terrorism through a social network analysis of an American-based Hezbollah network involved in trade diversion of cigarettes for self-financing purposes. The study has three goals: (1) to explore the structural characteristics of an Islamic extremist network involved in trade diversion; (2) to identify key actors in the network and their links to other network participants; and (3) to compare these findings with the depiction of the network and its structure provided by US public authorities. The study used court documents and open source information to identify network participants and all the links existing among them were coded. It used the software package “Pajek” and also provided visual representations of the networks through sociograms. The findings reveal important features of a so-called “dark network” and provide practical implications for policy-makers involved in counterstrategies, improving their understanding of the relational aspects and dynamics among network participants that can sometimes be overlooked. First, only six out of 34 participants in the conspiracy were identified as supporters of Hezbollah, thus supporting the so-called “crime–terror nexus” theory. Second, while previous research has tended to neglect the existence of lower-level interactions occurring outside static and predetermined organizational settings, evidence was found that links between extremists and non-extremists occurred within fluid and dynamic structures that form part of broader social networks. This key point questions the validity of simplistic labels such as “terrorist cell” or “criminal organization” when used with reference to entities that involve both extremists and non-extremists. This finding has policy implications, given that this type of “hybrid” network may require a different investigative and prosecutorial approach combining strategies and tools from both organized crime and terrorism investigations. Finally, our actor-centered analysis showed interesting similarities as well as differences between our findings and the way prosecutors classified suspects based on their role in the conspiracy.

ARTICLE HISTORY

Received 18 May 2015
Accepted 16 July 2015

KEYWORDS

Terrorism; extremism;
globalization; political
violence

Introduction

This exploratory study examines the nexus between crime and terrorism through a social network analysis of an extremist Hezbollah network involved in trade diversion for self-financing purposes. We had three goals: (1) to explore the structural characteristics of a Hezbollah network involved in trade diversion; (2) to identify the network's key actors and their links to other participants; and (3) to compare these findings with the US government's depiction of the network's structure. We found important features of a typical example of a so-called "dark network" and the different links existing between extremists and non-extremists (i.e. individuals for whom an extremist ideological connection could not be established) involved in terrorism financing activities. Our findings also had practical implications that could be useful to policy-makers and justice officials involved in counterstrategies by improving their understanding of the relational aspects and dynamics among network participants, which can sometimes be overlooked or misinterpreted.

Trade diversion involves diverting items from a low-price to high-price market to profit from different tax rates and exchange rate policies for either international trade or different priced markets within the same country (deKieffer, 2008). Experts argue that trade diversion has been used by both organized crime groups and terrorist organizations to launder money and raise funds (deKieffer, 2008; see also Looney, 2005). Despite a growing body of literature on the links between crime and terrorism, however, few studies focus on trade diversion as a terrorism-financing tool.

According to deKieffer (2008), trade diversion can take on many forms or techniques, including "boosting," product counterfeiting, sampling diversion, fraudulent charities, and smuggling, although not all have been linked to terrorism financing. Boosting involves stealing items that are then put into a diverted market for profit. Products most often sought after by "booster rings" range from condoms to computer products to over-the-counter medication (deKieffer, 2008).

Product counterfeiting involves creating and selling items labeled to mimic name-brand items. Drugs are a common item that has been counterfeited. However, until However, until the case here under study, counterfeit pharmaceuticals in the United States had not been linked to any terrorist groups (deKieffer, 2008). In addition to cigarettes, other common contraband and counterfeit products are electronics, CDs, movies, computers, sneakers, soda products, games, jewelry, perfumes, and textiles (Hudson, 2003; Sverdlick, 2005). Al Qaida is said to traffic arms, drugs, uranium, and engage in money laundering in the tri-border area (where Paraguay, Brazil, and Argentina meet) with Chinese and Russian mafias. Similarly, Hezbollah reportedly had ties to the Hong Kong mafia with trafficking pirated products between China and the tri-border area (Hudson, 2003).

Sampling diversion, or the sale of sample products provided by companies at low cost, has not been associated with terrorist financing. In contrast, charity fraud has been associated with terrorist financing. Charity fraud in relation to diversion is when products are solicited for the purposes of a charity and then sold for profit. Lastly, smuggling is the transportation of legitimate products whose distribution is either restricted or taxed differently in the target market than in the home market (deKieffer, 2008). A common contraband product is cigarettes due to the different tax rates applied in different countries and jurisdictions. Cigarette diversion can occur by purchasing the product for sale overseas tax-free and then diverting the product for sale in the United States. Domestically, contraband cigarettes have

also been purchased in states that apply low tax rates, then shipped and sold in states with high tax rates. More recently, such activities have been traced to financing terrorism and have been used by multiple terrorist organizations, including Al Qaida, Euskadi Ta Askatasuna (ETA) Hezbollah, Hamas, the Irish Republican Army (IRA), Partiya Karkerên Kurdistanê (PKK), as well as other Islamic jihadist groups from the Middle East and North Africa (Billingslea, 2004; Coker, 2003; Horwitz, 2004; Shelley & Melzer, 2008).

In the United States, there are specific legal provisions indicating when federal charges can be brought for cigarette smuggling. Such activity is only illegal when more than 300 cartons, or 60,000 cigarettes, are bought without paying the appropriate state taxes (Horwitz, 2004). Investigating cigarette diversion schemes that cross state lines is complicated and labor intensive, and even with plausible connections to a terrorist group it is often difficult to establish a connection that meets legal requirements. Given these practical complications, cigarette diversion may be a greater source of terrorist financing than is confirmed by legal cases. Ultimately, it is difficult to know how much of the profits gained from trade diversion contribute to terrorist groups. The greater the flow of illegal products and contraband items around the world, the more difficult it is to intervene or monitor the amount of money contributing to terrorism (Levi, 2010).

We next describe the procedure we followed in the case selection and construct the “dark” network. We then describe the social network analytic tools we used and present our findings. We conclude by placing these findings in context and highlighting their implications in terms of counterterrorism strategies. We also discuss a number of important issues for future research to address.

Data and methods

We identified a trade diversion scheme to use as a case study for this project through purposive sampling from the US Extremist Crime Database (ECDB) (Freilich, Chermak, Belli, Gruenewald & Parkin, 2014). The ECDB is supported by the Department of Homeland Security (DHS) and the National Consortium for the Study of Terrorism and Responses to Terrorism (START). The selected case study is referred to by prosecutorial authorities as the “Hammoud enterprise”, a multi-million-dollar criminal conspiracy that ran between 1996 and 2002.¹ Its members were primarily based in Dearborn, Michigan, but the network operated in multiple states (Michigan, Florida, Georgia, Illinois, Kentucky, Missouri, New York, North Carolina, and West Virginia) and foreign countries (Lebanon, Canada, Brazil, Paraguay, and China). According to the prosecution, members of the Hammoud enterprise purchased hundreds of cartons of cigarettes in low-tax or no-tax jurisdictions, such as North Carolina and on an Indian Reservation in New York State, then ferried them weekly to Michigan and New York where they were redistributed, netting profits of up to \$500,000 per week. They also reportedly produced counterfeit cigarette tax stamps for the states of Michigan, California, Illinois, and New York. The group eventually moved to new illegal business ventures, such as trafficking in stolen and counterfeit goods, including counterfeit “Viagra” pills smuggled from Florida as well as the Middle East, China, and Europe, counterfeit “Zig-Zag” cigarette rolling papers, stolen socks, toilet paper, and “Similac” infant formula. The indictment alleges that “the criminal enterprise was bound together by a common heritage (Lebanese); a common language (Arabic); allegiance to and support of Hezbollah; blood relations; and a common purpose of generating large sums of cash illegally”.²

The scheme had already been coded in the ECDB using open source information uncovered following the ECDB's protocol for systematic searching, which includes 31 internet engines (Freilich et al., 2014). We supplemented the available information and collected additional structural and attribute data on the scheme's participants, by acquiring a variety of court documents linked to the case study under examination. These federal court cases were prosecuted in Michigan and New York between 2004 and 2008. Although there are limitations that are discussed later, court documents are considered the "gold standard" and to be more reliable than other sources, such as the media, because the information is given under oath or by legal parties in the court and the persons testifying are usually subjected to cross-examination (Freilich et al., 2014; Hamm, 2007; Sageman, 2004). When information on variables was unknown after reading the court transcripts, open source searches were conducted to fill in the missing data.³ In total, there were 41 court documents linked to this case study, including indictments, judgments, plea agreements, sentencing memoranda, a motion of release, a discovery notice, a letter to the court, and, most importantly, transcripts. Transcripts were specifically sought to obtain descriptions of activities directly given by the suspects or those known to the suspects. These court records totaled 1020 pages, averaging 24.88 pages per document. Of these court documents, 15 were transcripts for seven suspects (one suspect had four transcripts). The average number of pages per transcript was 51.73.

To construct the network, first we identified all participants in the criminal conspiracy (in Social Network Analysis (SNA) terms also called "actors" or "nodes") and then coded all the links existing among them. We used a broad definition of "link" (or "tie"), including a variety of possible social relationships (e.g. business partners, relatives, neighbors, and acquaintances) as long as some form of meaningful tie existed between the actors and this was functional to the conspiracy. Population boundaries were determined by the information obtained through open-source documents. The use of archival network data has become common in SNA studies because it provides unobtrusive measures of social ties allowing for tracing relationships of actors who may be reluctant to grant interviews, such as offenders or terrorists (Marsden, 2005). This method has, however, some limitations due to the problem of missing data and so-called "fuzzy boundaries", which particularly affect covert networks (Malm, Bichler, & Van De Walle, 2010; Morselli, 2009; Sparrow, 1991; Xu & Chen, 2008). Criminologists rarely have access to "whole networks" of criminals and terrorists with full knowledge of their identities and links. Therefore, small-scale studies are often considered better settings for social network analysis, while keeping in mind that covert networks drawn from open-source information will most likely be incomplete (Krebs, 2002; Malm et al., 2010; Sparrow, 1991).

According to the First Superseding Indictment, dated 14 April 2004, the so-called "Hammoud enterprise" comprised 19 members who were charged with a variety of criminal offenses.⁴ Only 11 of the 19 who were indicted were actually prosecuted and eventually pleaded guilty, while the remaining eight were fugitives and remain at large as of today. Court documents mentioned 14 additional individuals who were also involved in the conspiracy as unindicted co-conspirators, and one last suspect who was also considered part of the conspiracy, though he was not indicted because he was already serving a sentence in a related criminal conspiracy. Therefore, the trade diversion network comprised 34 members in total.

Different analysis routines were used to explore patterns of interaction among the members of the trade diversion network, focusing specifically on cohesion, centralization, and centrality measures, which have traditionally been used to understand the distribution of

power and control within social settings (Freeman, 1979; Hanneman & Riddle, 2005). These analyses were performed using the software package “Pajek” (de Nooy, Mrvar, & Batagelj, 2005). At the network level, we examined four basic SNA measures that have also been used in the analysis of criminal and terrorist networks (see Baker & Faulkner, 1993; Krebs, 2002; Morselli, 2009; Van der Hulst, 2009):

- (1) *Density* – a measure of social cohesion estimating the degree of connectedness among network members as a proportion between the number of observed ties and the maximum number of possible ties (Freeman, 1979). Density values range from 0, indicating that the network is empty (i.e. no ties are present), to 1 when the network is complete (i.e., all individuals are connected with each other).
- (2) *Average nodal degree* – an additional measure of social connectedness to supplement *Density* analysis, which is estimated by calculating the average number of lines incident with each node, or in other words the average number of neighbors each actor has (Wasserman & Faust, 1994).
- (3) *Centralization* – an index, ranging from 0 to 1, that provides a measure of variation around a central tendency as a characteristic of the overall network. The larger the index is, the more likely there will be few actors with high centrality scores, while the remaining ones will be less central (Wasserman & Faust, 1994, p. 176). See below for a definition of two types of centralization scores examined in this study: “degree centralization” and “betweenness centralization”.
- (4) *Average geodesic path* – The geodesic distance in a network is the number of ties in the shortest possible walk (*path*) between any pair of actors. The average geodesic distance is the sum of the shortest paths between all pairs of actors divided by the number of possible pairs of actors (Hanneman & Riddle, 2005).

Research shows that individuals who participate in a criminal enterprise or a terrorist network play different roles that are instrumental to the functioning and survival of their organizational structure (Krebs, 2002; Morselli, 2009; Natarajan, 2006). To identify key players in the trade diversion network, we conducted an actor-centrality analysis focusing on two measures that are considered particularly meaningful in the context of covert networks:

- (5) *Degree centrality* – measured as the number of actors adjacent to it, or, in simpler terms, the number of actors each network member is directly linked with (Wasserman & Faust, 1994). Degree centrality provides an indication of prominence and visibility, and it is often associated with power and leadership. However, in the context of covert networks, this can be a disadvantage, because higher visibility also means higher vulnerability and exposure, which can possibly translate into a higher likelihood of being discovered and apprehended.
- (6) *Betweenness centrality* – which identifies actors lying on the geodesic path (i.e., shortest distance) between pairs of actors in the network (Knoke & Yang, 2008). Actors with high betweenness centrality are mediators connecting other subsets of the network that would otherwise be disconnected. Betweenness centrality analysis is considered particularly important in the study of covert networks because it allows for detecting brokers, i.e., individuals who usually link otherwise unconnected parts of the network and, therefore, control the flow of information (Freeman, 1979; Morselli, 2009; Sparrow 1991). From a criminal justice perspective, it has been argued

Table 1. Actors' descriptive statistics.

	<i>N</i>	%
Total	34	100.0
Male	33	97.1
Extremist	6	17.6
Indicted	19	55.9
Convicted	12	35.3
Role		
Primary leader	3	8.8
Secondary leader	10	29.4
Minor participant	7	20.6
Unindicted co-conspirator	14	41.2

that targeting “brokers” or “cut-points”, that have a strategic position, instead of traditional gang or organized crime leaders, may have a positive impact on network disruption strategies (Malm et al., 2010; McGloin, 2005).

Finally, we provided visual representations of the networks through sociograms, which offer a useful and complementary perspective to view and understand network patterning.

Results

Table 1 details descriptive characteristics of the trade diversion network members. Only six out of 34 participants (18%) in the conspiracy were identified as Islamic extremists, more specifically supporters of Hezbollah. The prosecution presented various elements in court as proof of this ideological link, including evidence that the suspects charged a “resistance tax” on contraband cigarettes, telling buyers that it was a fee to support Hezbollah; reportedly expelled from the enterprise people who disagreed with supporting Hezbollah; had personal ties to various Hezbollah leaders; conducted wire transfers to Lebanese bank accounts; and physically smuggled cash into Lebanon.⁵ The participants were all male, except for one woman, married to one of the Hammoud brothers, who was not prosecuted because she was deemed a minor participant.

The prosecution recognized differences in the role played by the scheme participants, distinguishing those identified as primary or secondary leaders from those whose role appeared to be less significant. Based on relevant information obtained from court documents, we therefore assigned each network participant to one of four groups: (a) *leaders*, key players who participated in almost all illegal activities conducted by the group ($n = 3$); (b) *secondary leaders*, suspects with a major role who often engaged in multiple activities related to the trade diversion trafficking business (e.g. supply, storage, transport, and distribution) as well as its financial aspects (e.g. depositing checks, conducting wire transfers, incorporating smoke shops, etc.; $n = 10$); (c) *minor participants*, suspects with a minor role or who engaged in one side of the business only (e.g. suppliers, couriers, street-sellers, financial conduits, etc.) ($n = 7$); and (d) *unindicted co-conspirators*, individuals who were assessed as having a marginal role because, for example, they were involved in one single incident ($n = 14$).

Network-level analysis

Table 2 presents structural characteristics of the trade diversion network, while Figure 1 provides a visual representation. A visual inspection of Figure 1 allows us to notice

Table 2. Network characteristics.

No. of nodes	34
No. of edges	117
No. of isolates	0
Density	0.202
Degree	
Average	6.889
Maximum	28
Degree centralization	0.679
Betweenness centralization	0.643
Average path	1.980

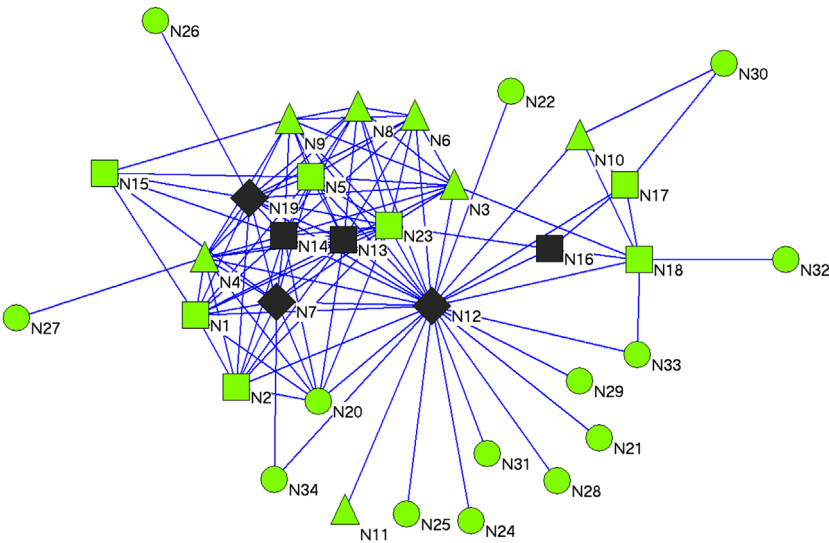


Figure 1. Trade diversion network sociogram showing extremists (in black) and roles as identified by US authorities (diamond = leader; square = secondary leader; triangle = minor participant; circle = unindicted co-conspirator).

the existence of different subgroups within the overall network. One actor in particular (N12), both a leader and an extremist (black diamond-shaped), stands out because of his central position evidenced by the numerous links with other actors. To the left of the sociogram, N12 is connected to a dense subgroup, including both extremists and non-extremists whose involvement in the conspiracy covers the whole spectrum of roles assigned by the prosecutor, i.e. leaders (diamond-shaped), secondary leaders (box-shaped), minor participants (triangle-shaped), and unindicted co-conspirators (circle). To the top right, N12 is linked to a smaller subgroup of actors comprising only one extremist (N16), whereas at the bottom, N12 is loosely connected to a number of non-extremists, most of whom had not been prosecuted. This type of core–periphery structure is in line with previous research on “covert networks” and has been particularly associated with criminal networks (Demiroz & Kapucu, 2012; Gimenez-Salinas Framis, 2011; Morselli, Giguere, & Petit, 2007).

The network-level analysis reveals that 34 actors were linked by 117 ties. Density, as mentioned, is calculated as a proportion between the number of observed ties and the

number of all possible ties existing in the network (Wasserman & Faust, 1994). Density in the trade diversion network equals 0.202, which means that 20.2% of the total possible ties between all actors are observed. According to social network research, a strongly connected network facilitates social exchanges and communication flows (Burt, 1984; Scott, 2000). However, social cohesion can be a problem in the context of covert networks. Criminal activities are usually conducted in secrecy. Too many interactions can be dangerous as members are more exposed to internal (e.g. non-participating business associates, criminal competitors, etc.) and external threats (e.g. corporate security, law enforcement, etc.; Baker & Faulkner, 1993; Erickson, 1981). As a result, covert networks tend to be lower in density compared to legitimate social networks (Malm et al., 2010; McGloin, 2004; Morselli, 2009; Natarajan, 2006). For example, Morselli (2009) compared six criminal networks of various sizes (ranging from 25 to 174 actors) and found density values varying from 3.4% to 11.7%. The density values in our data are consistent with this research, confirming that the trade diversion network is a typical lowly connected “dark network”. Average degree, which is an additional measure of the degree of connectivity, supports this finding. On average, each actor was connected to seven other individuals, though there is a significant variation among actor members, as indicated by the maximum average degree, which equals 28 ties.

The network centrality analysis reveals other important features of the network. Degree centralization measures the network’s tendency to be more or less centralized taking into account variations within all actor degree centralities. The degree centralization value in the trade diversion network reveals a highly centralized network with a value of 0.679, or 67.9%. High degree centralization in social networks can be interpreted as an indication of power and leadership. In covert networks, however, it can also indicate higher visibility and, therefore, vulnerability. Translated to our setting, this means that the network was more centralized around a few prominent individuals with many direct ties, which made them central but also more vulnerable to external attacks. The trade diversion network also has high betweenness centralization (respectively 0.643, or 64.3%), which suggests that there are large variations in actors’ betweenness centrality measures. In other words, consistent with previous studies on covert networks, there appear to be individuals who function as “bridges” or “brokers”, controlling information flows and providing strategic alliances (Morselli & Roy, 2008). Path length between actors is also considered an important measure of secrecy, and therefore safety, within illegal networks. The average path length between two random actors is 2, which means that a node in the network is approximately two connections away from a random node. This is quite a short path distance and can easily lead to detection of other nodes (Demiroz & Kapucu, 2012).

Actor-level analysis

After examining network-level features of the trade diversion network, we conducted an actor-level centrality analysis to identify key players. Understanding how each actor is positioned in the network and in relation with one another can reveal important aspects of the network functioning as well as its potential vulnerabilities. From a social network perspective, actors’ importance is equated with power and centrality, as power is inherently relational (Hanneman & Riddle, 2005). For this study we focused on two types of actor centrality measures that play a significant role in “dark networks”: (a) *degree centrality*, which refers

Table 3. Actor-level centrality measures.

Actor	Degree centrality		Betweenness centrality		Role*	Extremist (Y/N)
	Rank	Value	Rank	Value		
N12	1	0.848485	1	0.655093	1	Y
N19	2	0.454545	2	0.074505	1	Y
N14	3	0.454545	10	0.017024	2	Y
N23	4	0.454545	7	0.022769	2	N
N13	5	0.424242	14	0.007934	2	Y
N7	6	0.363636	8	0.021083	1	Y
N5	7	0.363636	11	0.009506	2	N
N4	6	0.363636	4	0.063483	3	N
N1	9	0.333333	13	0.008772	2	N
N9	10	0.333333	12	0.009489	3	N
N3	11	0.30303	9	0.017929	3	N
N8	12	0.30303	16	0.001503	3	N
N2	13	0.272727	17	0.000473	2	N
N6	14	0.272727	19	0	3	N
N20	15	0.242424	21	0	4	N
N18	16	0.212121	3	0.069444	2	N
N15	17	0.181818	18	0.000473	2	N
N17	18	0.151515	5	0.03125	2	N
N10	19	0.121212	6	0.028093	3	N
N16	20	0.121212	15	0.002841	2	Y
N30	21	0.060606	30	0	4	N
N33	22	0.060606	33	0	4	N
N34	23	0.060606	34	0	4	N
N11	24	0.030303	20	0	3	N
N21	25	0.030303	22	0	4	N
N22	26	0.030303	23	0	4	N
N24	27	0.030303	24	0	4	N
N25	28	0.030303	25	0	4	N
N26	29	0.030303	26	0	4	N
N27	30	0.030303	27	0	4	N
N28	31	0.030303	28	0	4	N
N29	32	0.030303	29	0	4	N
N31	33	0.030303	31	0	4	N
N32	34	0.030303	32	0	4	N

Notes: *1 = primary leader; 2 = secondary leader; 3 = minor participant; 4 = unindicted co-conspirator.

to the number of direct ties each actor has and helps identify individuals who are likely to be “leaders”; and (b) *betweenness centrality*, which reveals “cut-points” or “brokers” – actors who bridge otherwise unconnected segments of the network and, therefore, likely control information flows (McGloin, 2005). Table 3 provides normalized degree and betweenness centrality scores. While interpreting the findings, we also refer to qualitative information obtained from the open-source documents to gain additional insight.

In the trade diversion network under study, two actors (N12 and N19) scored highest on both measures of centrality. This means that they were both “leaders” and “brokers”, because of the higher number of direct links compared to the other actors (high degree centrality) as well as their role as bridges between different actors’ subsets (high betweenness centrality). Morselli (2009) described a similar patterning in a drug trafficking network that he defined as “an overlap between the networks of three key participants” (p. 77). The open-source information confirms the central role of N12. According to the authorities, N12 was the mastermind behind the Hammoud conspiracy. He ran the contraband cigarette traffic business with his brothers and other associates from 1996 and was involved in the acquisition and redistribution of untaxed cigarettes from Dearborn, Michigan, from the very beginning. He

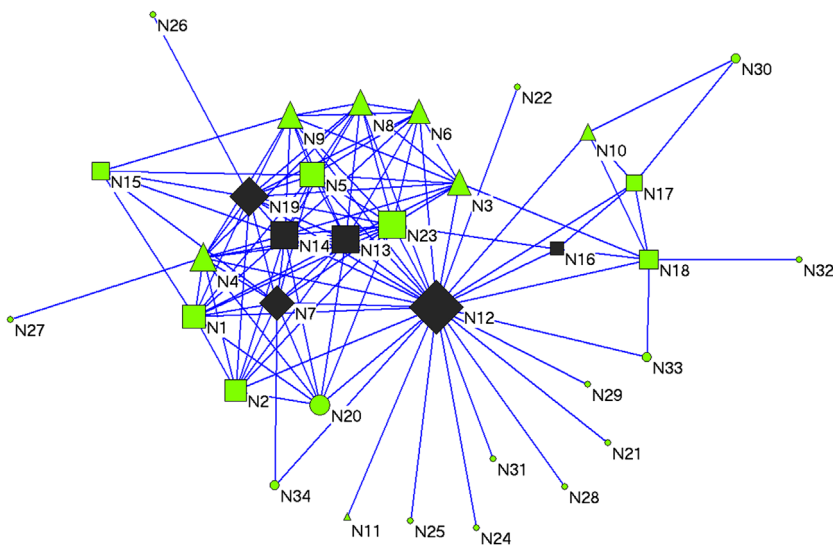


Figure 2. Degree centrality sociogram (most central actors are bigger).

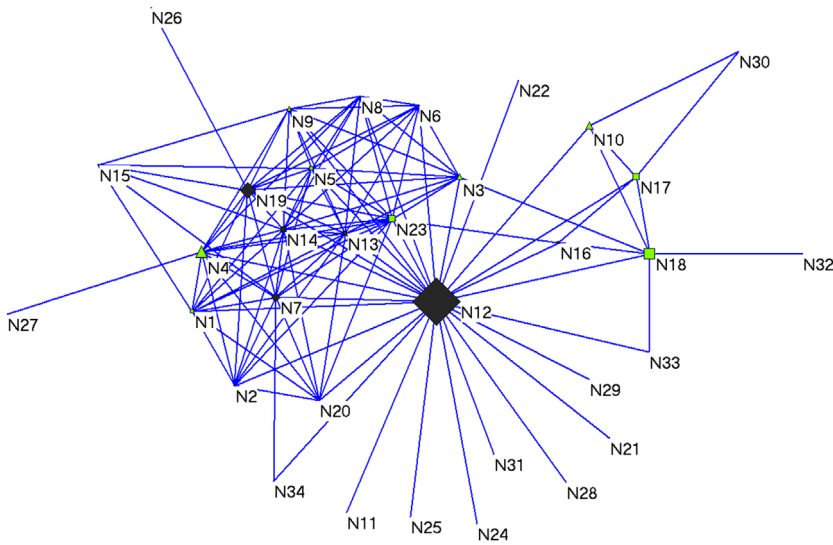


Figure 3. Betweenness centrality sociogram (most central actors are bigger).

also reportedly maintained warehouses in Michigan; worked to obtain, produce, and distribute millions of state cigarette tax stamps; and was later involved in the production and distribution of counterfeit versions of tax stamps and sale of stolen socks, toilet paper, and Similac infant formula. His centrality is evident if we study the Figures 2 and 3.

N12 clearly dominates the scene in both degree and betweenness centrality sociograms. His involvement in the network was, therefore, crucial to its functioning. This also means that his capture and early elimination from the network would probably have had significant consequences for the other actors and the network as a whole, possibly leading to its

“disruption”. In the literature on covert networks, there is no commonly accepted definition of “network disruption”, though it is usually referred to as a possible byproduct of the “removal of central nodes” (Oliver, 2014). Unfortunately, however, N12 was never arrested and remains a fugitive believed to be living in Lebanon. The implications of this finding will be further elaborated in the next section.

N19, the second most central actor and co-leader of the conspiracy, was one of N12’s key business partners. He was involved in the redistribution of contraband cigarettes in Michigan and in New York as well as the production and distribution of counterfeit state cigarette tax stamps after Michigan enacted tax stamps for cigarettes in 1998. At the time of the Hammoud conspiracy’s first indictment, he was already serving time after pleading guilty before the Detroit federal district court in 2003 to racketeering and providing material support to Hezbollah in a previous case. The prosecution identified a third leader (N7), a cab driver who acted as a courier of tax stamps and cigarettes, which he transported across North Carolina, New York, Kentucky, and Michigan, from 1997 to 2000. N7 was also a money launderer who delivered large amounts of cash to various locations as payment for contraband, opened bank accounts in his name to transfer funds, deposited checks, and sent money via wire transfer. N7 was indicted in 2004 and pleaded guilty in 2006. Interestingly, however, the centrality analysis places him sixth in the degree centrality ranking and eighth in the betweenness centrality one. In other words, there were three individuals (namely N14, N23, and N13) who were more “degree-central”, and thus potentially more visible despite authorities having identified them as minor participants, and five actors who were better connectors (N18, N4, N17, N10, and N23), and whose elimination would therefore have been better from a network disruption perspective. This finding also has implications that will be discussed in more depth in the next section.

N14 and N23 scored equal after the two main leaders (N12 and N19) with respect to degree centrality. Thus, based on the theory underlying actor centrality, they should have been considered major actors. The prosecution instead assessed both actors as secondary leaders. N14 was also identified as an avid supporter of Hezbollah. He reportedly had close ties with N7, being also a cab driver and courier and originally from Canada. However, he was never arrested and remains at large. Although there is no clear information from the open sources, it is possible that N14’s role was partly overlooked, while N7, who seemingly played a very similar role in the conspiracy, was considered a primary leader simply because the latter, unlike the former, had been apprehended. N23 was a street seller and distributor of contraband cigarettes from Michigan to New York. Court evidence indicates that, on numerous occasions between January and August 1997, N23 possessed, transported, and distributed large quantities of contraband cigarettes. He was indicted originally in 1997, and pleaded guilty in 2004 to one count of trafficking in contraband cigarettes in violation of 18 USC sections 2342(a) and 2344(a). There is no indication that he was a Hezbollah supporter. According to the trial transcripts, he was originally from Lebanon and lived with his mother near Detroit at the time of his arrest; he had a high-school education and was unemployed. Unfortunately, the open sources fail to provide any additional information that could help us understand why he was assessed as a secondary instead of primary leader. Considering his young age at the time of arrest, the fact that he was one of the first to be arrested and pleaded guilty very early on, there is a possibility that the whole investigation started from him and that he became a government informant. This would explain why the network analysis results showed him having such a central role in the conspiracy. In other words, it

is possible that he was indeed a key player for the investigators because he triggered the case by revealing the identity of the other actors, although he may have been just the “tip of the iceberg”. Finally, N13, the fifth most central actor according to the actor centrality analysis, was also identified as a secondary leader. According to the court documents, he was an avid supporter of Hezbollah and engaged in several activities for the group linked to the production and distribution of counterfeit state cigarette tax stamps as well as sale of counterfeit cigarettes in Michigan and New York. He is also originally from Lebanon, but was never arrested and remains at large as of today, which again possibly explains why he was not regarded as a primary leader.

The betweenness centrality analysis reveals other important features of the network structure that were missed by the prosecutors. As mentioned, N12's highest score indicates that he was not only a primary leader but also the most important connector in the network. In fact, the difference with the second highest betweenness score, N19, is substantial (from 0.65 to 0.07), suggesting that the conspiracy probably played out because of N12's “networking” skills. Figure 3 makes this visible, given that all other actors appear smaller in size. N7, the third leader of the conspiracy according to the prosecution, was instead not a “broker”. There were four others who played a more important role bridging other parts of the network (N18, N4, N17, N10, and N23). Interestingly, three out of five “brokers” were business owners with legitimate backgrounds; three were considered secondary leaders, and the other two minor participants; and none of them was reportedly identified as an extremist.

N4's role in the conspiracy was more financial-oriented. He was one of N12's older brothers and was involved in several financial activities, including handling the money, giving loan money on occasions, and transferring large amounts of cash via wire transfer. Unlike his brother, he was a successful and accomplished businessman with an unblemished employment record, including owning a corporation at APCO Oil that sold petroleum products to various brand gas stations in the area. He pleaded guilty in 2009 to minor charges and was given a fine of US\$100,000. N10, N17, and N18 were key players in the Viagra business conspiracy but also had connections with individuals involved in other conspiracies. This most likely explains their high betweenness scores. N17, originally from Canada and still a fugitive, was in charge of obtaining and distributing counterfeit Viagra pills. According to court documents, he was probably the main contact to the Viagra business. N10 was the supplier of counterfeit Viagra tablets and provided them to other conspiracy members. He met with N18 in Atlanta and sold him several thousand Viagra tablets. He was in the medical equipment sales business, pleaded guilty in 2009, and was sentenced to one day in prison and supervised release for three years, six months of which was in home confinement. Finally, N23, as mentioned above, was probably the informant who triggered the whole investigation. As for the centrality score, this probably explains his high betweenness, given that he was most likely the person who provided the names of the other actors to the authorities.

Discussion and conclusion

The first key finding of this exploratory study is that the trade diversion network here examined included a substantial number of non-extremists, who were in fact more numerous than the identified political extremists (on a ratio of 6 to 1).⁶ This provides preliminary support to the so-called “crime–terror nexus”, which criminologists have attempted to explain in various ways. Shelley and Picarelli (2005), for example, found that criminal and terrorist groups have

engaged in “business relationships” involving short-term transactions. Makarenko (2004) identified four possible stages of interaction with different levels of involvement, ranging from simple alliances, usually to fill an operational or expertise gap, to more complex long-term phenomena whereby a terrorist group transforms into a criminal one or vice versa. Most scholars agree that joint ventures between “criminals” and “terrorists” are usually opportunistic and temporary, and only in very rare instances do they turn into something deeper and more transformative (Hutchinson & O’Malley, 2007; Williams, 2008). Despite the relevance of these studies, which set the foundation for important theoretical considerations, the findings are limited as they usually employ relatively simple qualitative methodologies (i.e. by examining incidents of collaboration between criminals and terrorists based on information reported in the media). Therefore, they lack the empirical basis to draw any meaningful conclusions. Further, previous research implicitly defines the crime–terror nexus as a group-level phenomenon, neglecting the existence of lower-level interactions occurring outside static and predetermined organizational settings. Through an exploratory network analysis, the present study provides evidence that links between extremists and non-extremists can instead occur within fluid and dynamic structures that form part of broader social networks (see also Belli, 2012). This key point therefore questions the validity of simplistic labels such as “terrorist cell” or “criminal organization” when used with reference to entities that involve both extremists and non-extremists, such as the trade diversion network here studied.

This finding has evident policy implications, given that this type of “hybrid” networks may require a different investigative and prosecutorial approach combining strategies and tools from both organized crime and terrorism investigations. Moreover, it highlights another key aspect of “covert” networks that researchers have recently started examining more in depth – that such networks are likely to be “multiplex”. In other words, it is likely that individuals who engage and collaborate in illegal ventures are also linked through other ties, such as kinship, friendship, business partnership, and so forth, some of which may be pre-existing and even facilitate network recruitment processes (Belli, 2012; Crossley, Edwards, Harries, & Stevenson, 2012; Malm et al., 2010; Sageman, 2004). This stresses the importance of gaining insight into the nature and type of links binding covert network members, as this added knowledge may provide investigators and prosecutors with a more diverse range of measures to tackle specific sub-networks (e.g. by offering amnesty from prosecution to family members with no proven ideological affiliation that played a minor role in the conspiracy and are willing to cooperate).

The topological analysis provides further support for this key finding. The structural characteristics of the network, with a ringleader surrounded by a large cluster of highly connected actors, resemble more those of a criminal organization than a terrorist cell. Researchers found that terrorist networks tend to display a dispersed and decentralized structure with separate cells that remain dormant until they are activated for specific operational objectives and members that remain separate to guarantee insulation (e.g. the 9/11 hijackers network described by Krebs, 2002; see also Demiroz & Kapucu, 2012). This structural patterning emphasizes security over efficiency that allows for a longer “time-to-task”, as terrorist organizations usually pursue medium-to-long-term objectives whose successful execution requires substantial preparation, planning, and organization (Krebs, 2002; Morselli, 2009). Criminal networks, instead, tend to sacrifice security for efficiency, which often translates into a denser and more centralized structure where information flows more easily among actors (Morselli et al., 2007). This conformation, however, means that the most prominent actors are likely to be more easily noticed and therefore at higher risk

of being apprehended. In a study on a drug trafficking network, Morselli and Roy (2008) detected a central core of ringleaders who directed operations and a number of peripheral members who carried out street-level activities. Similarly, in the trade diversion network, the ringleader most likely oversaw the overall functioning of the network and was directly linked to several other members that were involved in various aspects of the production, transportation, and sale of counterfeit cigarettes and other products. They were willing to sacrifice some degree of security in favor of a more efficient configuration with shorter paths between core and periphery. Interestingly, even public authorities implicitly agree with this depiction of the network. Although prosecutors tried to emphasize the Hezbollah connection in court, all suspects were in fact charged with participation in a Racketeer Influenced and Corrupt Organizations Act (RICO) conspiracy, which is normally used to prosecute organized crime cases.

Besides understanding the structure of a trade diversion network for terrorism financing purposes, this study also aimed to identify key actors and compare these results with the description provided by federal authorities. The actor-centered analysis showed interesting similarities as well as differences between our findings and the way prosecutors classified suspects based on their role in the conspiracy. While the prosecution did recognize the existence of individuals with different roles, the classification was based on a quasi-hierarchical configuration, which comprised three primary leaders followed by a small group of secondary leaders and a larger number of minor participants. The network analysis allowed us instead, first of all, to provide a more nuanced definition of “significance” by distinguishing between traditional “leaders” and “brokers”. Further, it also allowed us to pinpoint actors who seemingly played a key role in the network but were overlooked by the prosecutors.

The findings support the prosecution’s argument that two individuals, N12 and N19, were the ringleaders. However, according to our analysis, they were not only the leaders of the conspiracy, as shown by the high “degree centrality” values, but they were also brokers, given their high “betweenness centrality” scores. Baker and Faulkner (1993) found that fraudsters who had high degree centrality in three price-fixing conspiracies received more guilty verdicts than individuals who were peripheral. Hence, they concluded that degree centrality in covert networks may result in higher visibility and risk of being targeted. In the case of the trade diversion network, the two actors were clearly identified as leaders and charged accordingly. Betweenness centrality, on the other hand, is considered the strongest indicator of sophistication and organization within a covert network (Morselli, 2009). “Brokers” control information asymmetries, and are therefore manipulators who can create or destroy connections within the network (Bruinsma & Bernasco, 2004; Burt, 2005; Natarajan, 2006). Their elimination may therefore prove to be an effective way to dismantle the overall network (Malm, 2006; McGloin, 2004). With respect to the trade diversion network, the prosecution of N12 and N19 was probably a good strategic move because it had the potential to affect the network as a whole. However, federal authorities were only able to effectively neutralize N19, who was arrested and pleaded guilty, while N12 was never captured and remains at large. The fact that he is wanted in the United States probably precludes him from leading the network. However, he is still around and could potentially pose a threat because of his demonstrated ability to lead a successful criminal conspiracy and recruit valuable accomplices.

Our findings, however, do not support the prosecution's stand that a third actor (N7), who was arrested and pleaded guilty, was also a key leader. The network analysis revealed instead other individuals who were better "leaders" and others who were better "brokers". The decision to focus on those identified as the primary leaders reflects a long-standing tradition within the US criminal justice system that originates from the 1960s and 1970s prosecution of criminal organizations (e.g. the Italian mafia), which were believed to be hierarchically structured and needed, therefore, to be "decapitated". If the prosecutors had truly followed this approach, then they should have also eliminated N13 and N14, who had more direct links than N7, making them more visible and, therefore, vulnerable. As mentioned, however, N13 and N14 were never apprehended. It is possible, therefore, that the decision to arrest N7 was based on existing evidence and the ability to successfully apprehend him. In other words, the choice of N7 over N13 and N14 may have simply been motivated by investigative limitations rather than strategic considerations.

The traditional criminal justice approach has been criticized because of its oversimplified notion that criminal groups are vertically structured with a leader (or leaders) at the top and various levels of associates underneath. If the authorities had aimed for network disruption, they should have gone for the brokers and removed at least four other individuals with higher betweenness centrality scores (McGloin, 2005). Again, the choice of one particular suspect over another for prosecution purposes was possibly based on the available evidence and other considerations, including the fact that the "brokers" were respected legitimate businessmen with no previous criminal record, and therefore potentially more difficult to prosecute. Interestingly, previous studies confirm that individuals with legitimate backgrounds and specialized knowledge, skills, or contacts, such financial advisors, accountants, and lawyers, oftentimes hold brokerage positions within "dark" networks (Morselli & Roy, 2008).

Recent research into network disruption strategies, however, shows that there are also important actor-level differences across criminal networks. For example, Bright, Hughes, and Chalmers (2012) studied a metamphetamine production and distribution network and noticed that individuals had discrete and non-interchangeable roles. The authors identified two key network characteristics – "role differentiation" and "specialization" – that could be vulnerabilities, because individuals were difficult to replace if eliminated. In the trade diversion network, we noticed instead that at least some actors (particularly the secondary leaders) performed various functions, ranging from acquiring and transporting cigarettes to conducting wire transfers. The random removal of one of these actors, therefore, may not necessarily cause the disruption of the network, as others could probably take over from them. This has probably something to do with the higher level of specialization required to do certain illicit activities (e.g. "cook meth"), but it also means that networks similar to the one here studied may be more difficult to dismantle than other networks, and could eventually re-form with new members replacing the old ones.

This finding brings to light an important aspect inherent in the use of social network analysis as applied to covert networks and particularly with respect to the development of effective counterstrategies. The discrepancies between our results and the decisions made by the prosecution show the gap between academic and practical interpretations of leadership and highlight the importance of developing clear and consistent operational definitions of "centrality" within covert networks. As noted, for the prosecution, pragmatic considerations may matter more than the suspect's structural positioning within the network. The debate

among network researchers remains open, with some scholars suggesting that high degree centrality scores are good predictors of leadership, and others suggesting that the high visibility produced by higher scores means that those particular actors are probably not the real leaders but rather more expendable subjects (for a good summary of this research, see Oliver, 2014). As mentioned, other researchers have instead brought attention to “betweenness centrality” in the context of disruption strategies, highlighting the benefits of cutting high betweenness centrality actors to isolate different subsets within the network. This approach finds support in the theory of the significance of “weak ties” over “strong ties”, as the former facilitate network evolution and expansion processes as opposed to the latter (Granovetter, 1973). A related note that is both a limitation of current research on covert networks as well as an opportunity for future studies is the fact that covert networks (like social networks more generally) tend to be dynamic rather than static. This means that the composition and relative centrality of network members is likely to change over time. Therefore, individuals who were central at the beginning of the illicit venture may not be so after a period of time. These considerations highlight the need to continue promoting the study of covert networks to improve our understanding of their functioning, identify potential vulnerabilities, and devise effective counterstrategies, bearing in mind that methodological advances may also require the revision of key theoretical constructs.

Notes

1. *United States of America v. Imad Hammoud, et al.*
2. *United States of America, Plaintiff, v. Imad Mohamad-Musbah Hammoud, et al., Defendants.* No. 03-CR-80406. United States District Court, ED Michigan, Southern Division. May 16, 2008. Opinion and Order Denying Defendants’ Motions to Dismiss Indictment. Retrieved from http://www.leagle.com/decision/20081266556FSupp2d710_11211/U.S.%20v.%20HAMMOUD
3. The amount of missing data differed across variables after using the court transcripts and conducting open-source searches for relevant information. Whether individuals were indicted in this case was easily ascertained with court documents, as was each person’s role in the scheme. In contrast, the extremist ideological connection was more difficult to confirm. Only six suspects were confirmed extremists and “avid supporters of FTO Hezbollah” in the indictment, while no information was found on the extremist ideological affiliation of the other group members after thorough open-source searching. Employment was also difficult to confirm, and we were able to code the occupation for only 12 out of the 34 individuals. The missing data was often associated with people who had less involvement in the scheme. For example, there were two individuals noted for their role in the scheme (drug manufacturer and truck driver) and involvement in the conspiracy, but they were not referred to by name or other identifying information. As such, these individuals have unknown values for gender and prior convictions. For all individuals coded in the scheme, however, their roles and relationships to others in the scheme are known and coded.
4. These include: conspiracy to violate the Racketeer Influenced and Corrupt Organizations Act (“RICO”), in violation of 18 USC § 1962(d); trafficking of contraband cigarettes, in violation of 18 USC § 2342; obtaining, producing and/or distributing millions of counterfeit goods in violation of 18 USC §§ 2315, 2320; transporting stolen goods (including cartons of stolen paper products and baby formula) in interstate commerce in violation of 18 USC §§ 2314, 2315; and money laundering in violation of 18 USC § 1656.
5. *UNITED STATES OF AMERICA, Plaintiff, vs. IMAD MOHAMAD-MUSBAH HAMMOUD, et al., Defendants.*, No. 03-CR-80406, UNITED STATES DISTRICT COURT FOR THE EASTERN DISTRICT OF MICHIGAN, SOUTHERN DIVISION, 556 F. Supp. 2d 710; 2008 US Dist., May 16, 2008.

6. It is worth noting that it is possible that there were more extremists involved and investigators were simply unable to retrieve evidence concerning ideological links or motives or, alternatively, that the open sources lacked this type of information.

Acknowledgement

The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of DHS, START.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This research was supported by the Office of University Programs Science and Technology Directorate of the U.S. Department of Homeland Security through the Center for the Study of Terrorism and Behavior (CSTAB – Center Lead) Grant made to the START Consortium (Grant # 2012-ST-61-CS0001). The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Department of Homeland Security, or START.

References

- Baker, W. E. & Faulkner, R. R. (1993). The social organization of conspiracy: Illegal networks in the heavy electrical equipment industry. *American Sociological Review*, 58, 837–860.
- Belli, R. (2012). *Where political extremists and greedy criminals meet: A comparative study of financial crimes and criminal networks in the United States*. Washington, DC: National Institute of Justice, BiblioGov.
- Billingslea, W. (2004). Illicit cigarette trafficking and the funding of terrorism. *The Police Chief*, 71, 49–59. Retrieved from http://policechiefmagazine.org/magazine/index.cfm?fuseaction=print_display&article_id=226&issue_id
- Bright, D. A., Hughes, C. E., & Chalmers, J. (2012). Illuminating dark networks: A social network analysis of an Australian drug trafficking syndicate. *Crime, Law, and Social Change*, 57, 151–176.
- Bruinsma, G. & Bernasco, W. (2004). Criminal groups and transnational illegal markets. *Crime, Law, and Social Change*, 41, 79–94.
- Burt, R. S. (1984). Network items and the general social survey. *Social Networks*, 6, 293–340.
- Burt, R. S. (2005). *Brokerage and closure: An introduction to social capital*. Oxford: Oxford University Press.
- Crossley, N., Edwards, G., Harries, E., & Stevenson, R. (2012). Covert social movement networks and the secrecy–efficiency trade off: The case of the UK suffragettes (1906–1914). *Social Networks*, 34, 634–644.
- Coker, D. (2003). Smoking may not only be hazardous to your health, but also to world political stability: The European Union's fight against cigarette smuggling rings that benefit terrorism. *European Journal of Crime, Criminal Law and Criminal Justice*, 11, 350–376.
- DeKieffer, D. E. (2008). Trade diversion as a fundraising and money laundering technique of terrorist organizations. In T. J. Biersteker & S. Eckert (Eds.), *Countering the financing of terrorism* (pp. 150–173). New York, NY: Routledge.
- Demiroz, F. & Kapucu, N. (2012). Anatomy of a dark network: The case of the Turkish Ergenekon terrorist organization. *Trends in Organized Crime*, 15, 271–295.
- De Nooy, W., Mrvar, A., & Batagelj, V. (2005). *Exploratory social network analysis with Pajek*. New York, NY: Cambridge University Press.
- Erickson, B. H. (1981). Secret societies and social structure. *Social Forces*, 60(1), 188–210.

- Freeman, L. C. (1979). Centrality in social networks: Conceptual clarification. *Social Networks*, 1, 215–239.
- Freilich, J. D., Chermak, S. M., Belli, R., Gruenewald, J., & Parkin, W. S. (2014). Introducing the United States extremist crime database (ECDB). *Terrorism and Political Violence*, 26, 372–384.
- Gimenez-Salinas Framis, A. (2011). *Illegal networks or criminal organizations: Power, roles and facilitators in four cocaine trafficking structures*. Madrid: Universidad Autónoma de Madrid.
- Granovetter, M. (1973). The strength of weak ties. *American Journal of Sociology*, 78, 1360–1380.
- Hamm, M. (2007). *Terrorism as crime: From Oklahoma City to Al Qaeda and beyond*. New York: New York University Press.
- Hanneman, R. A., & Riddle, M. (2005). *Introduction to social network methods*. Retrieved from <http://faculty.ucr.edu/~hanneman/nettext/>
- Horwitz, S. (2004). Cigarette smuggling linked to terrorism. *Washingtonpost.com*. [Online] Retrieved from <http://www.washingtonpost.com/wp-dyn/articles/A23384-2004Jun7.html>
- Hudson, R. (2003). *Terrorist and organized crime groups in the tri-border area (TBA) of South America*. A Report Prepared by the Federal Research Division, Library of Congress under an Interagency Agreement with the Crime and Narcotics Center Director of Central Intelligence.
- Hutchinson, S. & O'Malley, P. (2007). A crime-terror nexus? Thinking on some of the links between terrorism and criminality. *Studies in Conflict and Terrorism*, 30, 1095–1107.
- Knoke, D., & Yang, S. (2008). *Social network analysis* (2nd ed.). Series: Quantitative Applications in the Social Sciences. Thousand Oaks, CA: Sage.
- Krebs, V. E. (2002). Mapping networks of terrorist cells. *Connections*, 24(3), 43–52.
- Levi, M. (2010). Combating the financing of terrorism a history and assessment of the control of 'threat finance'. *British Journal of Criminology*, 50, 650–669.
- Looney, R. E. (2005). Profiles of corruption in the Middle East. *Journal of South Asian and Middle Eastern Studies*, 28(4), 1–20.
- Makarenko, T. (2004). The crime-terror continuum: Tracing the interplay between transnational organised crime and terrorism. *Global Crime*, 6(1), 129–145.
- Malm, A. (2006). *Marijuana cultivation in British Columbia: Utilizing spatial and social network analysis to inform evidence-based policy and planning* (Unpublished doctoral dissertation). Simon Fraser University.
- Malm, A., Bichler, G., & Van De Walle, S. (2010). Comparing the ties that bind criminal networks: Is blood thicker than water? *Security Journal*, 23(1), 52–74.
- Marsden, P. (2005). Recent developments in network measurement. In P. J. Carrington, J. Scott, & S. Wasserman (Eds.), *Models and methods in social network analysis* (pp. 8–30). New York, NY: Cambridge University Press.
- McGloin, J. M. (2004). *Associations among criminal gang members as a defining factor of organization and as a predictor of criminal behavior: The gang landscape of Newark, New Jersey* (Unpublished doctoral dissertation). Rutgers The State University of New Jersey, Newark, NJ. Retrieved from Dissertations & Theses: Full Text (Publication No. AAT 3131756).
- McGloin, J. M. (2005). Policy and intervention considerations of a network analysis of street gangs. *Criminology and Public Policy*, 4, 607–636.
- Morselli, C. (2009). *Inside criminal networks*. New York, NY: Springer.
- Morselli, C., Giguere, C., & Petit, K. (2007). The efficiency/security trade-off in criminal networks. *Social Networks*, 29, 143–153.
- Morselli, C. & Roy, J. (2008). Brokerage qualifications in ringing operations. *Criminology*, 46(1), 71–98.
- Natarajan, M. (2006). Understanding the structure of a large heroin distribution network: A quantitative analysis of qualitative data. *Journal of Quantitative Criminology*, 22(2), 171–192.
- Oliver, K. (2014). *Covert networks: structures, processes and types* (Mitchell Centre Working Paper). Manchester, NH: University of Manchester.
- Sageman, M. (2004). *Understanding terror networks*. Philadelphia, PA: University of Pennsylvania Press.
- Scott, J. (2000). *Social network analysis*. Newbury Park, CA: Sage.
- Shelley, L. & Melzer, S. (2008). The nexus of organized crime and terrorism: Two case studies in cigarette smuggling. *International Journal of Comparative and Applied Criminal Justice*, 32(1), 43–63.
- Shelley, L. I. & Picarelli, J. T. (2005). Methods and motives: Exploring links between transnational organized crime and international terrorism. *Trends in Organized Crime*, 9(2), 52–67.

- Sparrow, M. K. (1991). The application of network analysis to criminal intelligence: An assessment of the prospects. *Social Networks*, 13, 251–274.
- Sverdlick, A. R. (2005). Terrorists and organized crime entrepreneurs in the “triple frontier” among Argentina, Brazil, and Paraguay. *Trends in Organized Crime*, 9, 84–93.
- Van der Hulst, R. C. (2009). Introduction to social network analysis (SNA) as an investigative tool. *Trends in Organized Crime*, 12, 101–121.
- Wasserman, S. & Faust, K. (1994). *Social network analysis*. Cambridge: Cambridge University Press.
- Williams, P. (2008). Terrorist financing and organized crime: Nexus, appropriation or transformation? In T. J. Biersteker & S. E. Eckert (Eds.), *Countering the financing of terrorism* (pp. 126–149). New York: Routledge.
- Xu, J. & Chen, H. (2008). The topology of dark networks. *Communications of the ACM*, 51(10), 58–65.